FRONT RANGE COMMUNITY COLLEGE — Westminster, CO

Product Name MyMathLab

Course Name Developmental Math sequence

Course Format Hybrid: Required four-hour, in-lab class + one hour each week required, mastery-based lab

Key Results Data from a developmental math redesign pilot indicates that the average rate of student progress in redesigned classes was nearly 40 percent higher than that in traditional classes.

Submitted by
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Course materials
MyMathLab and *Developmental Math,* Squires and Wyrick

Setting

Front Range Community College is a two-year college serving more than 30,000 students a year from campuses in Brighton, Ft. Collins, Longmont, and Westminster. The largest community college in Colorado, it is the number one transfer institution for the University of Colorado-Boulder, Colorado State University, and Metropolitan State University of Denver.

Challenges and Goals

Neither instructors nor administrators were satisfied with the outcomes they were experiencing via traditional developmental course delivery methods. They chose to redesign in order to provide students with personalized learning experiences and the freedom to work at their own paces while also receiving more-frequent individualized feedback. Instructors and administrators both anticipated that as students felt more empowered, they would become more involved in their own learning and more successful overall.

Implementation

In spring 2013, Front Range's Brighton Center campus redesigned campus redesigned a two-semester developmental math sequence into one developmental course such that students meet in a computer lab on regularly scheduled days, they attend additional required lab hours, and content is delivered primarily via MyMathLab.

Students spend the majority of class time working independently on content modules in MyMathLab. Students from all levels of the developmental math sequence work in the same room with an instructor present.

Students begin each module with a pretest. If they don't pass the pretest, they must work through video tutorials, concept checks, and homework assignments before taking a posttest at the end of the module. Students' notes from the video tutorials are submitted and graded. These notes are checked by the instructor when a student has questions—if no notes are present or they are deemed insufficient, the student is required to watch the video again and take additional notes. Students must earn a score of at least 75 percent on concept checks and at least 80 percent on homework to move to the next topic. They are given unlimited attempts at homework and all learning aids are available.

Students must earn at least 75 percent on a proctored, password-protected module posttest to progress to the next module. Students who score less than 75 percent are required to remediate by working in the Study Plan, redoing homework, making test corrections, and meeting with an instructor before they can retake the posttest.

Students may accelerate at their own pace, which enables them to continue to the next sequence of modules during the same semester.

The redesigned classes had a significantly higher number of final course grades of A and B, and no Cs.

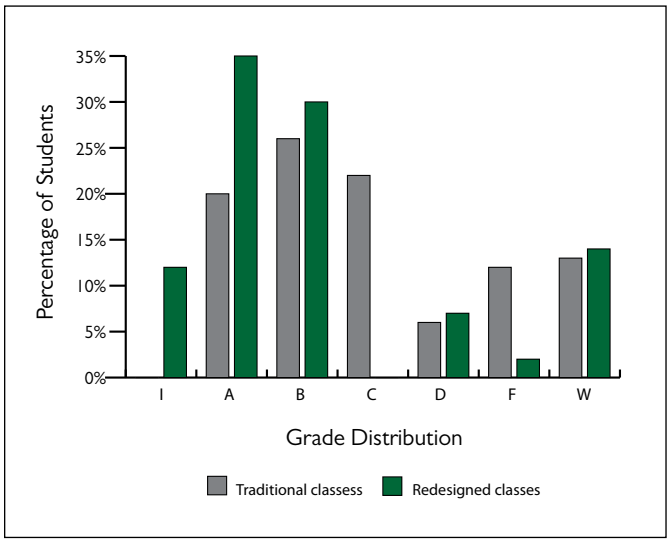

Figure 1. Comparison of Pass Rates from Traditional and Redesigned Courses, Spring 2013 (traditional, *n* = 985; redesign, *n* = 43)

	Traditional Courses		Redesign Courses	
Grade	Count	Percent	Count	Percent
I		0%	5	12%
S/A	199	20%	15	35%
S/B	256	26%	13	30%
S/C	214	22%		0%
U/D	62	6%	3	7%
U/F	123	12%	1	2%
W	131	13%	6	14%
TOTAL	985	100%	43	100%
Pass Rate	68%		65%	
Pass Rate w/ I	68%		77%	

Table 1. Comparison of Pass Rates from Traditional and Redesigned Courses, Spring 2013 (traditional, *n* = 985; redesign, *n* = 43)

Results and Data

Table 1 and Figure 1 show the pass rates in the redesigned and traditional, face-to-face courses (all other compressed prealgebra with basic math, introductory algebra, and intermediate algebra classes in Westminster and Brighton) during spring 2013.

Two things immediately emerged from the data:

1. By traditional pass-rate calculations, the redesign classes were slightly ahead of the control classes. Brenkert believes that while four percentage points (six percent) higher is not much, considering the ancillary benefits, the redesigned classes being at least even with the traditional classes is significant.
2. The redesigned classes had a higher number of final course grades of A and B, and no Cs. The developmental math redesign committee believe that this could either be evidence of greater retention of curriculum content or a further sign of the structural differences mentioned earlier.

However, traditional pass rates are a binary measure—either a student passes or they don't. Because the redesign students are able to work ahead and needn't start from the beginning if they need to retake the course, traditional pass rates do not accurately portray their performance. With the nuance of self-pacing added to the equation, the traditional pass rate calculation, while helpful, does not tell the entire story.

To more accurately compare student progress within each course type, an alternative metric—one that demonstrates average student progress—is needed. The average progression rate shows how much of a course an average student finished in a semester. In a traditional class, because passing students complete one full course and failing ones must start over (have completed zero courses), the progression rate will equal the pass rate. It will fluctuate between 0 (all students failing) and 1 (all students passing).

Although only 65 percent of students in the redesigned classes passed, students progressed on average through 95 percent of a course—illustrating the true advantage of redesign.

	Traditional Courses	Redesigned Courses
Average progression of students who did not pass	0.00	0.31
Average progression of students who passed or received an Incomplete	1.00	1.15
Overall average progression rate	0.68	0.95

Table 2. Progression Rates for Traditional and Redesigned Courses, Spring 2013 (traditional, *n* = 985; redesign, *n* = 43)

In the redesign courses, the progression rate captures the dynamic nature of self-pacing. Because the progression rate fluctuates based on both whether or not the student passed the course and how much of the course the student has passed, it more accurately demonstrates a student's progress. In addition, the progression rate portrays the benefits to the students who progressed into the next class.

Although 65 percent of students in the redesigned classes passed, students progressed on average through 95 percent of a course—illustrating the true advantage of redesign. The overall average progress in the redesign classes was nearly 40 percent higher than that in the traditional, control classes.

The Student Experience

Students in the redesign classes completed surveys at both the beginning and end of the semester. Following are observations taken from each. Scores are on a Likert-like point scale in which 1 = *very negative* and 5 = *very positive*.

Beginning of the semester

- One-third of the students knew about the difference in the structure of the course prior to registering.
- The average score concerning students' feelings about math was 3.2. The developmental math redesign committee believed that the population was neutral and not predisposed to like the course material.
- When asked what aspect of the course most excited them, 62 percent of the students referenced some aspect of individualized pacing.

End of the semester

91% of respondents rated their experience in the class as either positive or very positive. The average score was over 4.5.

77% of respondents reported that they received more support in the redesigned class than they have in traditional math classes.

77% of respondents reported that they had more control over their learning in the redesigned class than they have in traditional math classes.

Selected comments

- "It was one of the most positive educational experiences I've ever had."
- "I would encourage anyone to take this class over a traditional math class."
- "I did more, the work helped me to be more knowledgeable, and it gave me a boost in confidence."
- "I feel as though I am good at math now."

Conclusion

Instructors classified their reflections on the first semester of this redesign into three categories: confirmations of expected results, unexpected revelations, and opportunities for future implementation.

Confirmations of expected results

Instructors believed that based on class performance and survey results, it appears that most students enjoyed and responded to scheduling their own pacing, a feature that more-dedicated students could truly take advantage of to move quickly through the curriculum. Pedagogically, the class structure effectively reinforced more procedural, skill-based learning. Students gained both more practice and more immediate feedback in the redesigned classes than in the more-traditional class structure. Finally, the redesigned courses made different demands on the instructors: class preparation shifted from lecture and presentation preparation to more-individualized review of student progress and preparation of tailored explanations, examples, and strategies.

Unexpected revelations

Instructors noted that the redesign structure—specifically, its lack of deadlines or traditional scheduling spaced evenly throughout the semester—could have resulted in significant procrastination. On the contrary, most students planned their own progress and effectively paced themselves. This additional challenge was a great opportunity for instructors to explicitly discuss student skills, such as time management, note taking, and test preparation; and for students to safely experiment with different ways to demonstrate their skills. By promoting individual conversations about these vital aspects of the learning process, the structure was credited with encouraging a level of metacognition that surpassed that of a traditional class structure.

Another unexpected benefit of the accelerated-pacing option was that students had complete control of their schedules. Six students completed at least two courses within one semester, and others finished one course before the semester ended, thereby freeing up time to focus on other classes or personal responsibilities outside of school. The committee believed that this kind of flexibility—a benefit not fully captured by the 40 percent progress rate—suggests that the redesign's ancillary benefits to students and instructors could actually be greater.

By increasing the amount of teacher-to-student interaction, the redesigned courses shift the relationships between instructors and students and, in many cases, helps students bond with their instructors. Word of these bonds has grown and despite the addition of another redesigned class, there is still a wait list for the fall semester.

Opportunities for future implementation

The committee maintained that the modular structure of this redesign could benefit certain degree programs. Programs could require students to know certain modules pertaining to relevant concepts, rather than entire courses that may include superfluous math concepts and present an impediment to completion.

This modular structure could be used, with slight adjustments, in the Colorado Community College System's developmental math curriculum. Modules could be rearranged to match learning objectives and seamlessly integrate into new developmental math courses. More structural changes would be needed to meet the corequisite and assessment preparation pieces of the new curriculum.

Finally, with an eye toward continually improving the redesign's structure, instructors are working on additional resources to supplement the online curriculum. These resources are intended to offer a broad, more-connected view of mathematical concepts.

Front Range's developmental math instructors are looking toward dramatic curriculum changes in 2015. The lessons learned during this redesign will directly inform their decisions about how to best motivate student success.

Implementation and results case studies share actual implementation practices and evaluate possible relationships between program implementation and student performance. The findings are not meant to imply causality or generalizability within or beyond these instances. Rather, they can begin to provide informed considerations for implementation and adaptation decisions in other user contexts. For this case study, mixed-methods designs were applied, and the data collected included qualitative data from interviews, quantitative program usage analytics, and performance data. Open-ended interviews were used to guide data collection.